

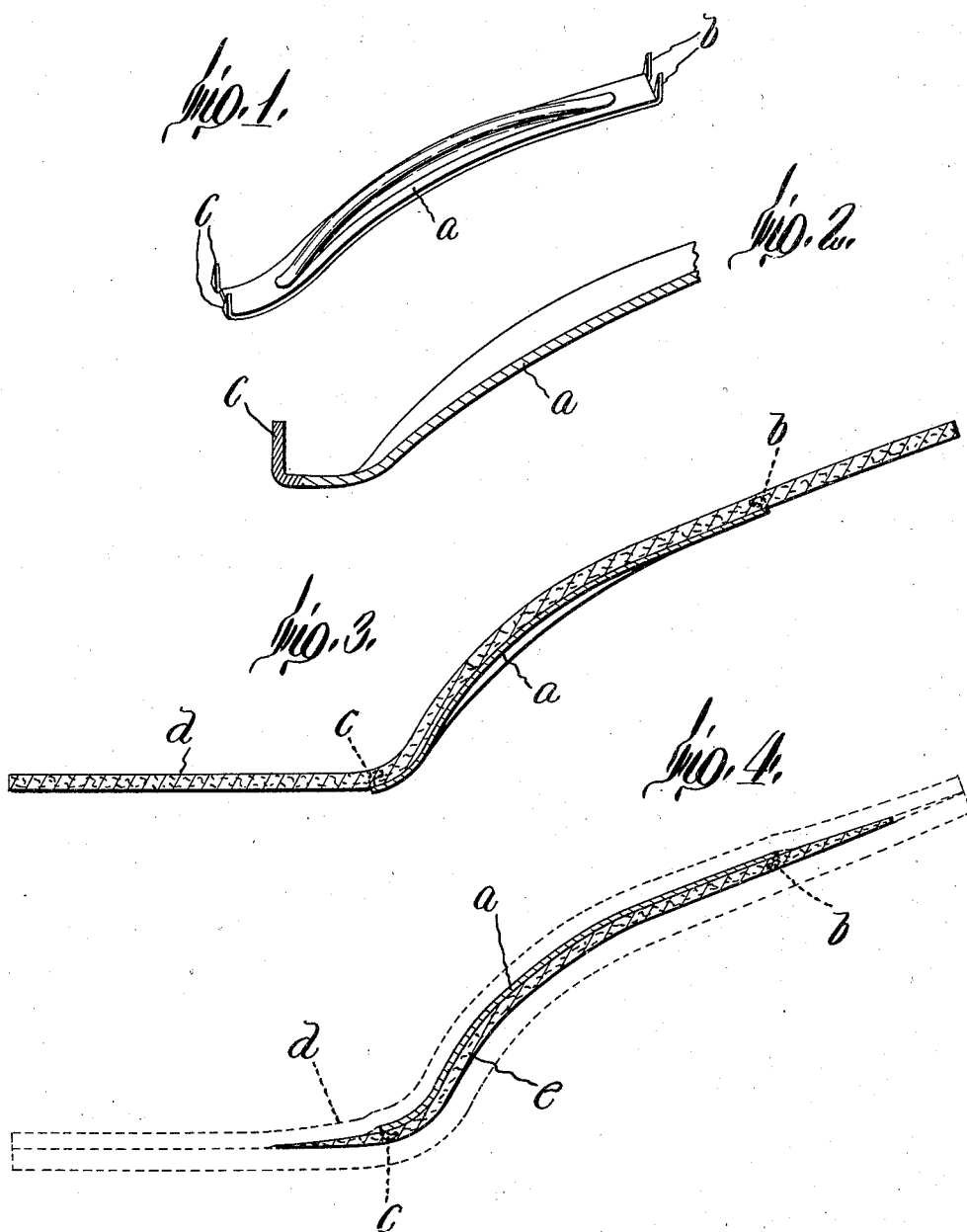
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HARDENED SHANK STIFFENER WITH CLINCHER PRONGS

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HARDENED SHANK STIFFENER WITH
CLINCHER PRONGS

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3 Claims. (Cl. 36—76)

The present invention relates to steel shank stiffeners for shoes. Such stiffeners are commonly called "shanks" by their makers and by those engaged in the shoe making business, wherefore in the following specification the article embodying this invention will be generally called by the same term rather than its longer and more precise designation.

The object of the invention, briefly stated, is to provide hardened steel shanks, which have the stiffness and elastic resilience due to hardening and tempering, with integral prongs of such ductility or flexibility that they can be bent to any extent necessary to clinch them firmly in the material of an innersole without danger of breaking off.

Hardened steel shanks have been known and used heretofore, but they have never been provided with clincher prongs because steel prongs having hardness comparable to that required for the necessary resilient stiffness of the shank body are brittle, and break off when attempt is made to clinch them. Hence all types of hardened shank, with one exception, have heretofore been made with a tack hole near one or both ends and have required insertion of a separate tack through one or both holes in order to secure them to the innersole of the shoes in which they are built. Tacking of shanks in place is objectionable to both shoe manufacturers and workers because it takes time and reduces the number of shoes on which the worker can operate in the course of the day, thus both increasing the cost of the shoe and decreasing the operator's income when paid on a piece work basis. Consequently operators are prone to omit the necessary tacks when this can be done without detection, leaving the shank loose, whereby the usefulness and comfort of the shoe to the wearer are reduced.

The exception above referred to is a shank of my own invention which is disclosed and claimed in an application for patent filed by me March 7, 1934, Serial No. 714,470, characterized by substantially square ended tabs which, when sunk into an innersole of sufficient thickness, anchor the shank firmly and securely enough without being clinched. But in order that the tabs may serve this purpose, the innersole stock must have a certain minimum thickness. Innersoles of less thickness than such minimum require clinched prongs, tabs or tacks to obtain the necessary security of connection.

In accordance with the present invention, a hardened steel shank may be provided with clinchable prongs long enough to pass all the way

through the thickest of innersoles and be clinched, or so short as to pass through only the thinnest of usable innersole material.

Drawing is furnished herewith to illustrate generically the principles of the invention, without attempt to show all the kinds and styles of shank in which it may be embodied.

In the drawing,—

Fig. 1 is a perspective view of such an illustrative shank;

Fig. 2 is a longitudinal section of one end of a shank embodying the invention, on an enlarged scale, indicating by differences in section lining the difference in quality between the body of the shank and its prongs;

Fig. 3 is a longitudinal section of an innersole with a shank of my invention applied thereto having its prongs clinched therein.

Fig. 4 shows a combination shank in which a steel shank of my invention is united with a filler of leather, leatherboard, or the like.

Like reference characters designate the same parts wherever they occur in all the figures.

The illustrative shank here shown consists of a body *a* having integral turned up prongs *b*, *b* and *c*, *c* at its opposite ends. The body is of hardened and tempered steel, whereby it is stiff and resilient, capable of flexing under the weight of the wearer of the shoe in which it is built, while continuously giving support to the arch of the wearer's foot, and of returning to normal position after being flexed. The prongs on the other hand are relatively soft. That is, while they have sufficient hardness and stiffness to be driven into the material of the innersole by a hammer blow, nevertheless they are not brittle, but are so ductile or flexible that they can be sharply bent without breaking. Hence when the shank is laid against an innersole applied to an iron bottomed last, a single hammer blow on the pronged part of the shank suffices to drive the prongs there located through the innersole and cause their ends to be bent over or doubled back by the last bottom. The result is shown in Fig. 3 where *d* represents such an innersole with the shank *a* applied to it and the prongs of the latter clinched in it.

In appearance the shank above described differs not at all from shanks heretofore known and used. The physical difference is of molecular structure, the characteristics of which are incapable of illustration by a drawing; but the fact that such difference exists between the prongs and body of the shank is illustrated in Fig. 2 by a difference in cross hatching of the

prong shown in section at one end of the shank from the cross hatching of the balance of the article.

These principles may be embodied in shanks of a wide variety of shapes and designs; whether provided with one or more prongs at either or both ends; whether the prongs are long or short, wide or narrow, finely or bluntly tapered; whether the prongs spring from an end edge or both end edges as shown, or from a side edge or an inner point between the edges near the end of the shank; whether the prongs project from the side which comes next to the innersole so that they may be embedded in the latter, or from the opposite side to be embedded in the fibrous constituent of a composite shank; or whether the body is stiffened by a longitudinal rib, as here shown, or otherwise, or is flat in cross section.

In making shanks conforming to this invention I prefer to use a carbon steel in sheet or strip form having a carbon content in the range between so called 50 point carbon and 90 point carbon, (.50% to .90%). With the steel in annealed condition, the shank blanks are cut from it, shaped, and the prongs or tabs turned up. Then the shanks are hardened by being heated to a temperature between 1440° F. and 1500° F., depending on the content of carbon, and quenched in oil. They are tempered by heating to a temperature which may be as high as 720° F. or as low as 575° F., or an intermediate degree, depending on the ultimate stiffness and springiness desired as well as on the carbon content. The hardness is drawn from the prongs, or from such prong or prongs as may be designed to be used for clinching, by local heat treatment of the prong alone; or at most to the prong and the material of the shank body immediately adjacent to it. Such heat treatment consists in heating the prong alone to the temperature used in hardening the shank, or a proximate temperature, for a brief period; so brief as to avoid danger of burning the prong or of sensibly diminishing the hardness of the shank as a whole. This heat treatment may be applied by dipping the prong, or the pronged end of the shank, into a bath of lead heated to the required temperature, for two or three seconds. It may also be given in other ways, as by exposing the prong to the heat of an electric arc for a fraction of a second brief enough to limit the heating effect as above indicated. However heated, the prong is allowed to cool gradually, whereby it is made sufficiently non-brittle to be bent as in clinching.

Hardness tests made on shanks of the composition above described and heat treated as described have given results on the Rockwell C scale

as follows: After hardening, the hardness ranges between about 58 and 68, depending on the carbon content of the steel and the quenching temperature. After tempering, the hardness range is from about 44 to 54, depending on the same factors and the temperature to which the hardened shanks are heated in tempering. The larger figures indicate greater hardness. Steel of any given composition is harder after heat treatment as the quenching temperature is higher and the temperature of tempering is lower. The hardness of the annealed prongs is very much the same in specimens of all compositions within the range indicated, being in the neighborhood of 22 to 26. A considerable variation is possible here within the scope of the invention, since the prongs may be somewhat harder than the completely annealed steel, provided only they are not too hard to be clinched.

The foregoing illustration of a preferred quality of steel and character of heat treatment is not exhaustive, or exclusive of other possible treatments. For instance, I may use a low carbon steel containing about .25-.30% carbon, and harden it by heating to from 1600° to 1650° F. and quenching in water. Shanks of this character require no tempering. Their prongs are annealed by being heated to a temperature of 1600° F., or slightly higher, and allowed to cool slowly.

What I claim and desire to secure by Letters Patent is:

1. A shank stiffener for shoes made of carbon steel having a carbon content in the range between .50% and .90% provided with one or more integral prong or prongs, the stiffener having a quality of hardness equivalent to that produced by quenching in oil from a temperature between 1440° F. and 1500° F. and tempering by heating to a temperature between 575° F. and 720° F., and the prong or prongs having a ductility equivalent to that of annealed steel.

2. A shank stiffener for shoes made of carbon steel and provided with an integral prong or a plurality of such prongs, the body of the stiffener having a hardness on the Rockwell C scale of between about 44 and about 54, and the prong or prongs having a hardness on the same scale of about 22 to about 26.

3. A shank stiffener for shoes made of spring-tempered carbon steel, provided with an integral upturned clincher prong, the hardness of the shank body being in the order of from 44 to 54 on the Rockwell C. scale and that of the prong being in the order of from 22 to 26 on the same scale.

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